The Palestinian toll included 29 assailants. tinians, opened fire and killed two. and the peace process," he said.

AUGUSTA, MAINE

The Associated Press

The Jaragua gecko is shown on a U.S. dime in this undated handout picture. The reptile is the smallest known lizard, measuring 0.6 inches from the base of its tail to its snout.

Scientists claim lizard world's tiniest

By ANDRES CALA
Associated Press Writer

BEATA ISLAND, Dominican Republic — Two American biologists have discovered the world's smallest known gecko — a lizard so tiny it can curl up comfortably on a dime.

The Jaragua Gecko is the smallest of all 23,000 species of reptiles, birds, and mammals, researchers said.

Richard Thomas and Blair Hedges found the dark brown lizard on the Dominican Republic's remote Beata Island in 1998. Their findings appear in the December issue of the Caribbean Journal of Science.

The Jaragua Gecko measures only 1.6 centimeters — a sliver more than half an inch — from the base of its tail to its snout.

"We don't know if they get any smaller," said Thomas, of the University of Puerto Rico. "We suspect reptiles have a physiological limit and we are approaching that limit."

The geckos were found on a desert island also home to giant lizards known as rhinoceros iguana. The geckos are slightly smaller than a related species living several islands away in the British Virgin Islands.

Hedges, an associate professor at Penn State University, speculates the gecko may have moved across a land bridge between the main island of Hispaniola and Beata Island during the last ice age.

The tiny lizard is one of about 80 species of Caribbean gecko, a family of soft-skinned, insect-eating lizards that have short, stout bodies and suction pads on their feet. It's unclear how many Jaragua geckos exist in the world.

The environment probably played a role in how the lizard became so small, Hedges said. Over millions of years, they likely filled a niche held in other places by small insect-eating spiders, he said.

The scientists believe the lizard eats tiny ants, spiders and soil-dwelling mites. Its size makes it vulnerable to tarantulas, snakes, centipedes and even other lizards.

The lizard, whose scientific name is Sphaerodactylus ariasae, was named after Yvonne Arias, a biologist and president of the Jaragua Group, a nonprofit organization that helps preserve the Dominican Republic's Jaragua National Park, which includes Beata Island.

Arias said the island's remoteness — it takes five hours by boat to reach Beata, a desolate isle of coral rock and limestone where about 70 fisherman are the only human inhabitants — probably has helped protect the habitat.

"Pressure from ecological groups has protected Beata Island up to now," she said on a recent expedition where she found one lizard under a shell and the other in a pile of dry leaves. "But we need more resources to educate people and to protect it."

15 AUGUST 2001 Saturday

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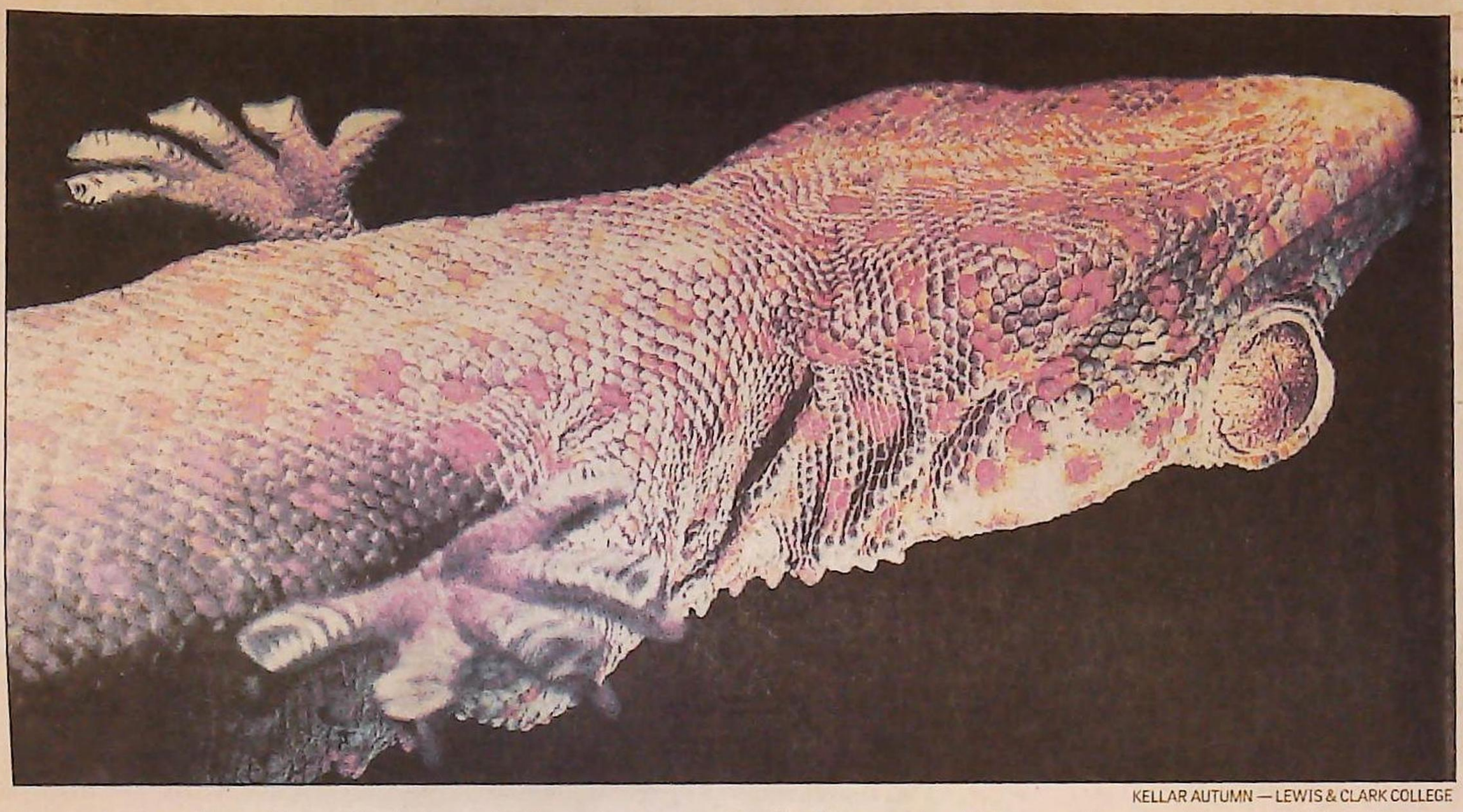
Biology



KELLAR AUTUMN — LEWIS & CLARK COLLEGE

Researchers say the position of tiny hairs on the feet allow geckos, like this Tokay gecko climbing on glass, to stick to smooth surfaces.

Sticky hairs keep geckos on wall

NEW STUDY SOLVES OLD MYSTERY OF CLIMBING PHENOMS

By William McCall
Associated Press

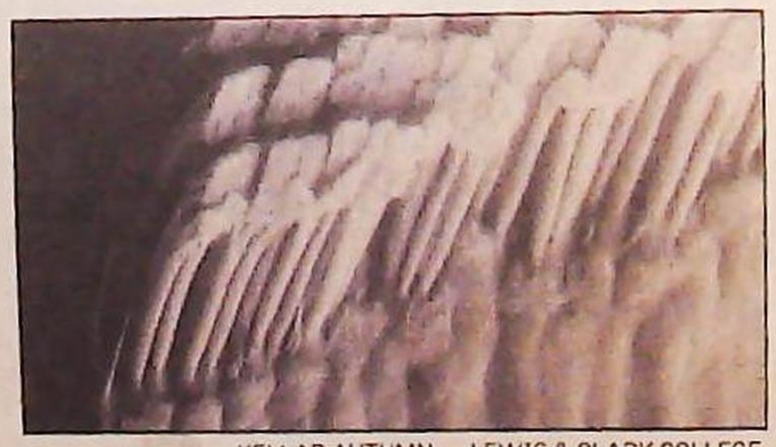
PORTLAND, Ore. — The mystery of what makes geckos stick to just about anything — a question that has puzzled scientific minds since Aristotle — finally has been solved, according to a new study.

The answer involves the geometry, not the biochemistry, of the lizard's feet, meaning scientists may be able to duplicate the same geometric principles to create things such as robots that can walk on any surface in any direction, the researchers say. Another possibility is something as simple as Band-Aids that hold tight but don't stick when they're peeled off.

"I just saw the movie 'Spider-Man' and I realized that some day we'll be able to do even better than he does sticking to things," said Kellar Autumn, a Lewis & Clark College biologist in Portland and lead author of the study published recently in the Proceedings of the National Academy of Sciences.

Researchers found that the tips of the hairs on the bottom of gecko feet are tiny enough to take advantage of a weak attraction between individual molecules called van der Waals forces.

Geckos have millions of microscopic hairs on the bottoms of their feet that are narrower than human hairs, and each splits off into 1,000 tips that are so small they can be detected only with an electron microscope.



KELLAR AUTUMN — LEWIS & CLARK COLLEGE

The millions of hairs take advantage of a weak attraction between individual molecules called van der Waals forces.

The shape of the hair tips also is critical, allowing the small lizard to scamper up walls and across ceilings by sticking its toes to nearly any smooth surface.

"What we discovered was the angle the little shaft of the hair makes with the surface is the critical variable," Autumn said. "The gecko has this really unique way of taking its feet off the wall — it peels its toes like tape. When that angle reaches 30 degrees, the hair pops off."

Scientists have been trying to solve the mystery for the past century, ever since Dutch physicist Johann van der Waals won the Nobel Prize in physics in 1910 for his research on the gaseous and liquid states of matter, Autumn said.

Earlier studies of gecko feet had reduced the explanation to either the capillary effect of tiny amounts of water that create suction or something that worked whether there was any water or not, in this case, the van der Waals attraction between molecules.

Autumn and a team of researchers at the University of California-Berkeley, the University of California-Santa Barbara and Stanford University fabricated a synthetic version of the gecko hairs and tried them on two different kinds of highly polished, extremely smooth semiconductor chip materials.

Both chips allow van der Waals forces to work, but a silicon-based chip also allows the capillary action of water to work. The hairs stuck to both chips, just like real gecko feet, Autumn said.

"I think the experimental evidence they provided is the definitive test — I think they've really nailed it with this one," said Bill Kier, a University of North Carolina at Chapel Hill biologist who studies the way octopuses stick to surfaces.

The study also is a valuable tool for developing synthetic materials, he said.

Kennebec Journal, Augusta, Maine

Finding the secret of stick-to-itiveness

Gecko analysis could lead to new adhesive

By MICHAEL STROH
The Baltimore Sun

For centuries geckos have been revered as one of nature's coolest climbers.

Whether they're skedaddling up smooth glass at three feet a second or dangling from a hotel ceiling by a single toe, there's almost nothing the little lizards can't scale. Greek philosopher Aristotle marveled at the gecko's ability to "run up and down a tree in any way, even with the head downwards." And for more than a century the gecko has tormented scientists trying to divine the secret to its grip.

Now a group of biologists and engineers, who call themselves the Gecko Team, has solved the long-standing mystery and created the first artificial adhesive based on the gecko's sticky secret. Their research, published Tuesday in the Proceedings of the National Academy of Sciences, could lead to everything from exotic new Post-It notes to sure-footed space robots capable of climbing Martian cliffs.

The secret to the gecko's grip, it turns out, hinges on one of the animal world's worst cases of split ends, and a quirky property of quantum physics known as the van der Waals force.

Geckos have millions of microscopic hairs sprouting from the bottom of their feet. The hairs, called setae ("see-tee"), split into as many as 1,000 tinier hairlets, each capped with a triangular pad whose shape has been likened to a hamburger flipper. These tips, called spatulae, are about the size of a small bacterium.

Over the years scientists have debated their function.

"The initial thought was maybe they were little suction cups," says Kellar Autumn, a biologist at Lewis and Clark College in Portland, Ore., and member of the Gecko Team.

Others speculated the tiny pads functioned more like spikes — the so-called "climber's boot" hypothesis. Still others thought geckos, like some species of ants and beetles, secreted a natural glue onto its hairy toes to hold onto leaves and prevent predators from prying them loose.

Over the years scientists have plunged geckos into beakers of water to see if they stick (they do). They've dropped the animals into vacuum chambers —killing the geckos but not diminishing the adhesive power of their tacky toes.

Scientists have bombarded geckos with X-rays and blasted them with ionizing air guns to neutralize static electricity, another force once thought to be helping the animals hold on.

"Little by little theories were eliminated," says Anthony Russell, a zoologist at the University of Calgary who has been studying geckos for more than three decades.

In the 1960s German scientist Uwe Hiller proposed another idea: perhaps the creatures stick using the van der Waals force.

Named after the 19th century Dutch physicist who first described it, the van der Waals force occurs when atoms come close to one another and — for a fleeting instant — display a weak electrical attraction.

The force is too subtle to be felt by humans when, for example, they press a palm to a wall. But could a gecko, with millions of microscopic pads to make contact with a surface, exploit this effect?

Autumn and a team from Stanford University and the University of California, Berkeley, set out to see.

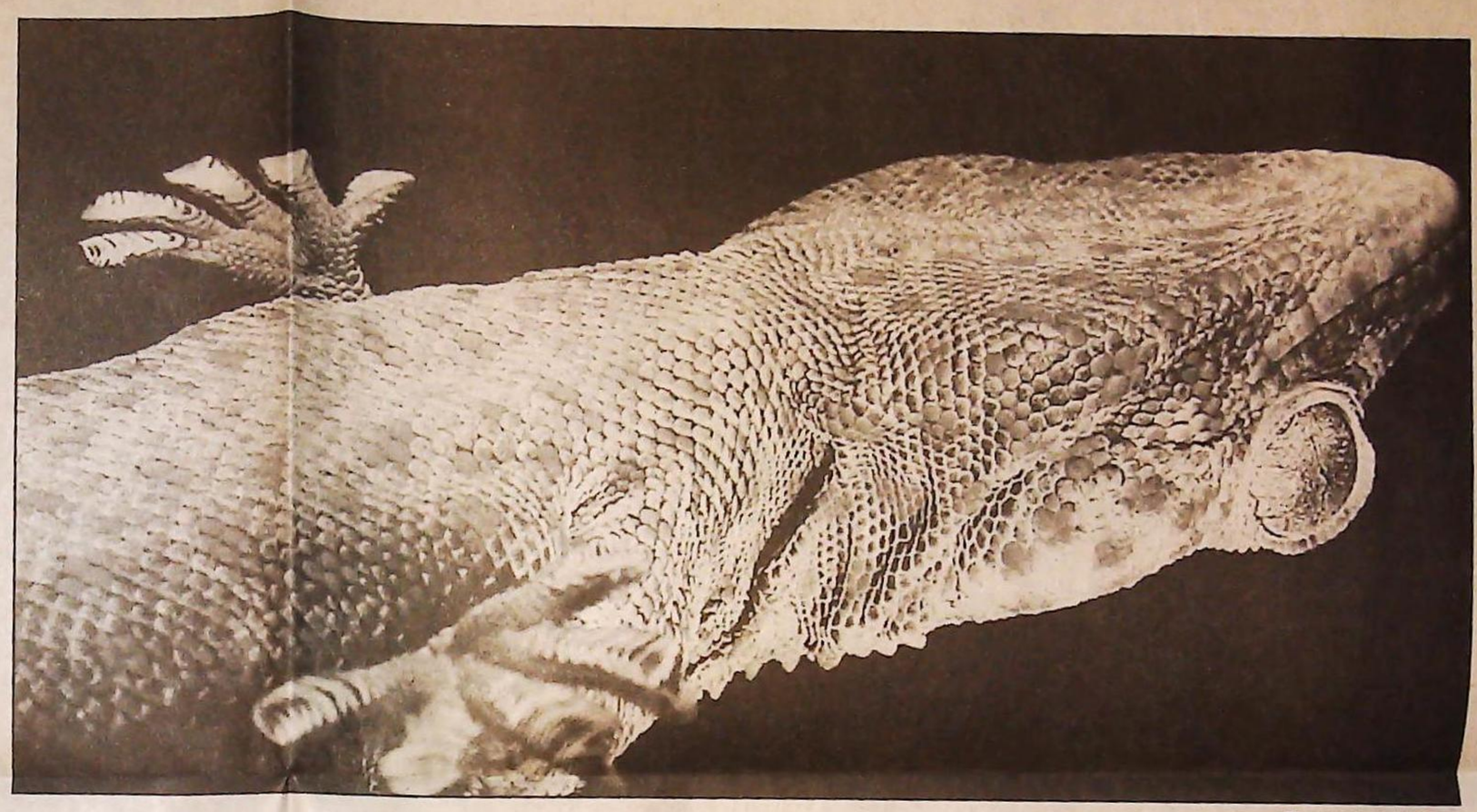
The effort led to the first measurement of the holding power of gecko hair. A single seta, the researchers found, could lift an ant. If all the hairs worked simultaneously, they could theoretically hoist a 280-pound man.

The discovery that van der Waals forces are behind the gecko's grip offers hope that engineers might be able to fabricate artificial adhesives based on the find — a sort of gecko glue.

Engineer Ronald Fearing at Berkeley has created artificial gecko spatulae out of silcone rubber. He found they stuck almost as well as the real thing.

And the gecko team has teamed up with a Somerville, Mass., robotics company called iRobot to develop robots based on the gecko foot. "If a robot can climb, it can get over anything," says Polly Pook, the company's research director.

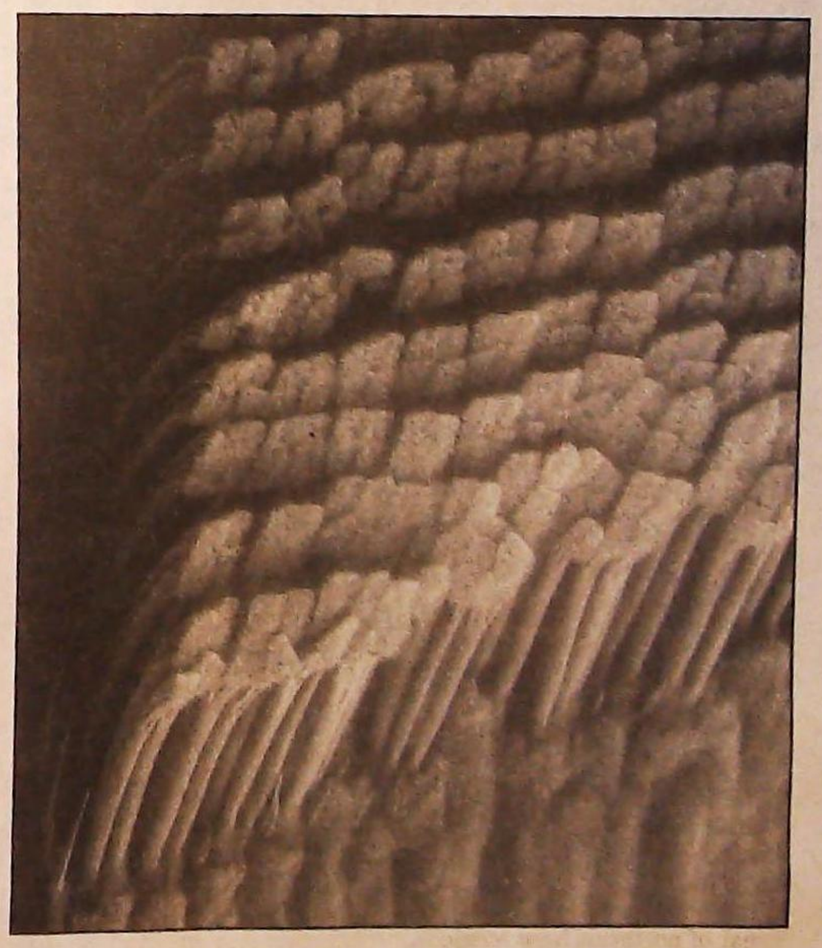
Because it also works in a vacuum, a gecko-based adhesive could be used by astronauts in space, Autumn says. The biologist even envisions a new class of shoes and gloves for mountain climbers covered with millions of synthetic gecko hairs.



The Associated Press

A Tokay gecko climbs while inverted on a pane of glass in this 2000 photo. The mystery of what makes a gecko's foot stick to just about anything finally has been solved. A research team's study in the Proceedings of the national Academy of Sciences shows that hairs on gecko feet too small to be seen by a conventional microscope apply a force know mostly to physicists who deal with the way molecules line up and stick to each other.

The Associated Press



Above a gecko foot adheres to a gallium-arsenide semiconductor, demonstrating van der Waals adhesion. At right, tiny hairs, called setae, are seen in this image taken with an electron microscope.

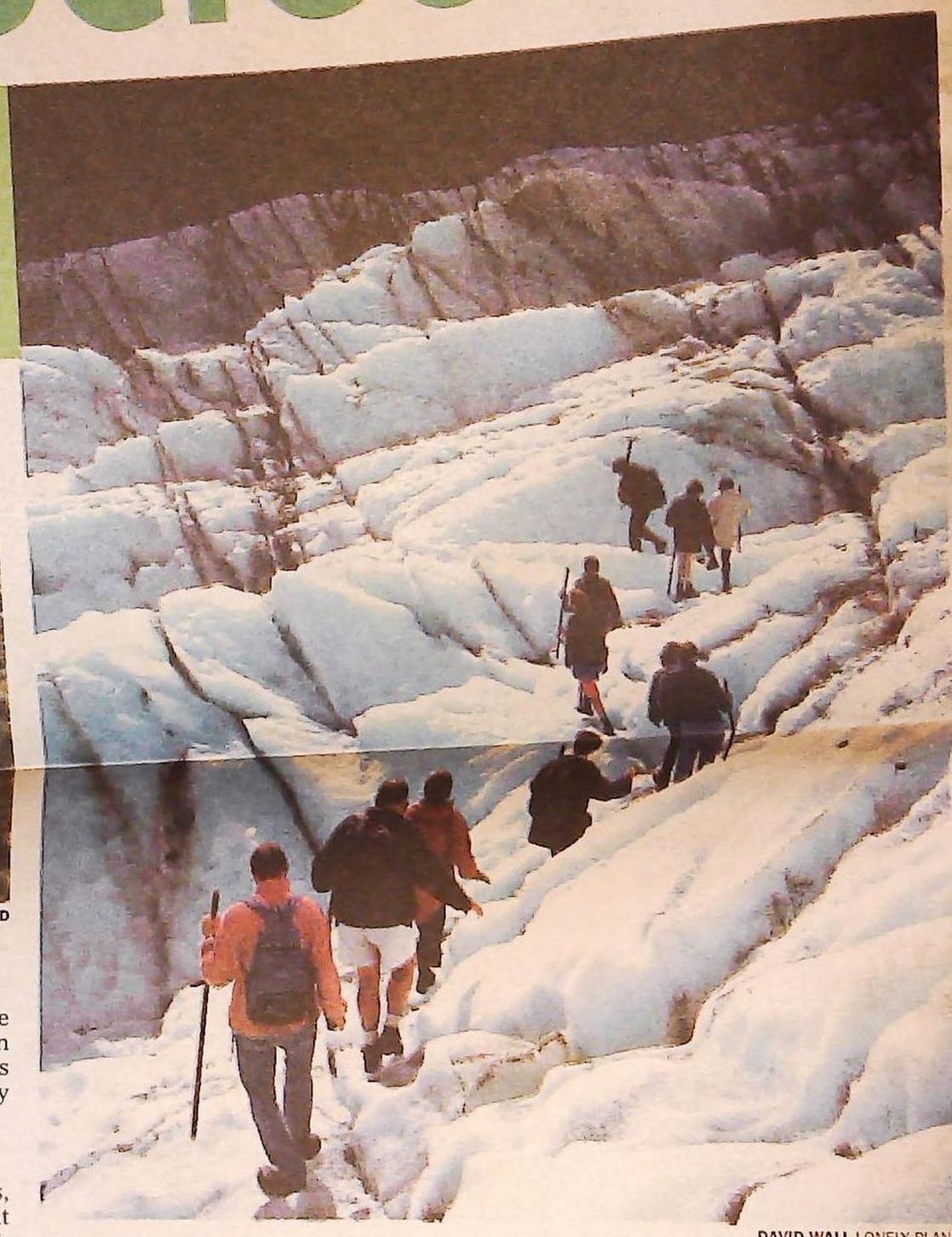
COVER STORY By Donna Petrozzello

Natural selection

Outdoor adventure abounds in New Zealand — but the biggest challenge may be fitting it all in

TOURISM NEW ZEALAND

KIWI KISMET A hiker pauses on Kepler Track, 42-mile trail that takes three days.



GRANT DIXON LONELY PLANET

'RING'-

DAVID WALL LONELY PLANET

SO ICE TO BE HERE Fox Glacier is a landscape of jagged peaks and smooth valleys.

For "Lord of the Rings" director Peter Jackson, New Zealand was Middle-Earth, but for adventure seekers and nature lovers, it's pure paradise.

Whether you get your thrills from hiking, bungee-jumping or simply soaking in pristine mountain scenery, there are countless ways to explore this country's natural treasures.

Eager to get as close as possible to the landscape made famous in Jackson's Oscar-winning trilogy, my husband, Mike, and I traveled to New Zealand in March. We chose to explore South Island, one of the country's two principal land masses.

Upon arriving at the airport in Christchurch, the first thing visitors see is a wall plastered with glossy pamphlets from hundreds of tour operators willing to take them almost anywhere, to do almost anything. All you have to do is decide where to jump in. We began our journey with a hike through Hobbit-land.

New Zealanders are rightfully proud of their stamping grounds and they've devised a network of hiking trails — known locally as "Great Walks" — to show them off. Many of the walks wind through Fiordland National Park, one of the largest protected regions of rainforest and mountain ranges in the world.

We decided to tackle the Kepler Track, a 42-mile alpine trail whose ridge stretches nearly a mile above sea level and takes three days to finish.

To get to the track's starting point, we traveled to Te Anau, a small lakeside town at the entrance to Fiordland, where hikers can find everything they need for a hearty nature walk.

KNOW YOUR OWN ABILITIES

Like many novice hikers—or trampers, as Kiwis call them —we were eager to hit the trail, but unaware of just how tough the going would get. Be warned: These trails are not for the weak of knee.

After stuffing our backpacks with rain gear, sleeping bags and all the freeze-dried food we could carry, we took a quick boat ride across Lake Te Anau to start the trail's uphill climb.

And climb we did for the next four hours, over a series of steep gravel switchbacks that snaked through a dense rainforest of trees covered with bluish-green moss and a thick undergrowth of leafy ferns. I began to imagine "Rings" characters Frodo and Sam hiding at the bottom of every birch as I took in the view and listened to the chirp of tomtit birds.

Although the scenery was beautiful, the hike was grueling. After a couple of hours, I began longing for a flat path the way some desert trekkers might fantasize about stumbling into a sparkling lake.

Eventually, we emerged from the rainforest onto a plateau dotted with golden, grassy tufts, called tussock, that stretched for miles. But my delight at seeing relatively flat terrain ahead lasted only a moment. That's when the rain hit.

Almost instantly, we were soaked by a freezing downpour that pounded us sideways in 40-mile-per-hour gusts as we made soggy tracks to the trail's first overnight cabin, Luxmore Hut.

Once inside and warmed by the wood stove, we chatted with other determined trampers whose hiking stories took the chill out of the air. That evening, we cooked a meal of rice and beans and, for dessert, gazed up at a clear night sky spotted with the Southern Hemisphere's brilliant stars. In all, it was a just reward for a hard day's work.

The second day began, thankfully, with a blue sky and a gradual climb. The air was crisp on the way to the saddle of Mount Luxmore, the trail's highest point, at 4,828 feet.

We paused not only to take in spectacular views of Lake Manapouri and the snow-capped peaks of the Murchison Mountain range, but also to marvel at the fact that we'd reached the summit.

Later that afternoon, we headed down the mountain in a steep descent that tested our stamina and our sore knees. But we smiled as we approached our second cabin, Iris Burn Hut, knowing the climb had been well worth the effort.

We reached the end of the Kepler Track a day later, after a leisurely final walk through its quiet forest. Back at the hostel that night, I had trouble remembering when a hot shower had felt as good.

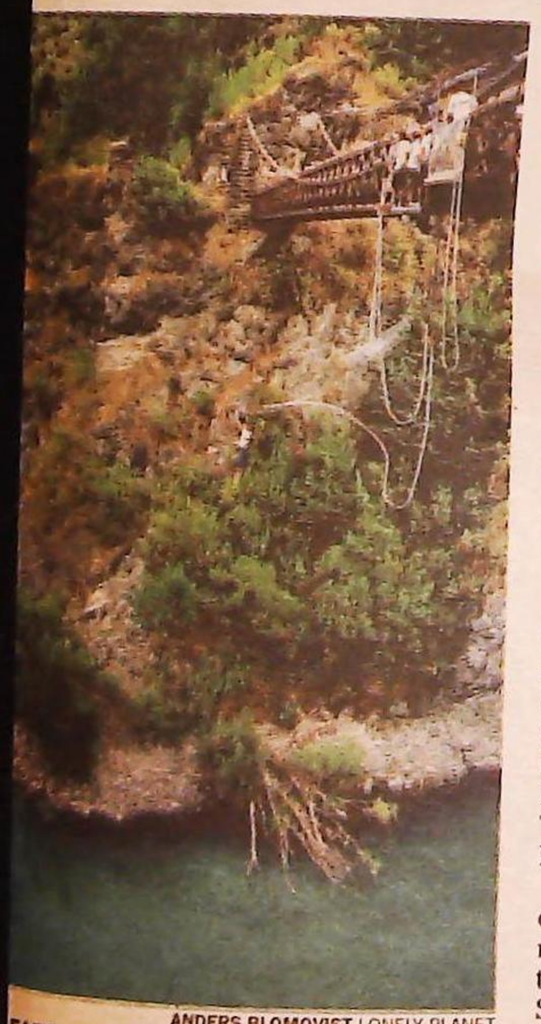
EASIER DOES IT

We spent the following day resting our legs. By morning, we were ready to take on a less strenuous challenge—a cruise along Milford Sound, a narrow finger of water that extends from Fiordland National Park to the Tasman Sea.

Even on a rainy day, the misty water canyon was captivating with its majestic mountain peaks, tumbling waterfalls and resident seals. The two-hour bus ride there was equally beautiful.

We bid farewell to Fiordland a day later and headed north to the South Island's adventure capital, Queenstown, where visitors can buy almost any thrill.

SCAPE It's easy to imagine Frodo jumping out from behind a tree in this mossy trail near the Iris Burn Hut on the Kepler Track.



ANDERS BLOMQVIST LONELY PLANET

EAPS Where bungee-jumping began

After all, this *is* the place where dventure-seeker A.J. Hackett opened the orld's first commercial bungee-jump site, n 1988. You still can leap from the original aunch (NZ$130 per jump, about US$87), a ridge over Queenstown's Kawarau River om which you'll plunge 141 feet.

Visitors can also drop their dollars on eart-stopping adventures, such as a "Fly by Wire" ride that sends you soaring in a rocket-style ship through a valley at up to 120 mph (NZ$155/US$104); "Shotover Jet," a high-speed boat ride that skims knee-deep water (NZ$89/US$60), and whitewater rafting through fast-moving mountain streams (NZ$119/US$80). Operators offering more traditional adventures, such as paragliding and skydiving, are also plentiful in the mountain town.

REACHING FOR THE 'RING'

Rather than blow our budget on a short-lived thrill, we chose to see more of "Rings" country upclose by taking a four-wheel-drive tour of Queenstown and various locations where Jackson and Co. filmed the movie.

The four-hour tour, costing NZ$125 (US$84) per person and operated by Glenorchy Air, included a visit to the site that served as a backdrop for the Battle of Amon Hen; the River Anduin, where the Pillar of Kings rose; the Remarkables Mountain Range, which served as Mount Doom, and the Arrow River, where Liv Tyler's Arwen carried Frodo to safety on horseback in "Rings."

Itching to see more of the sights that only New Zealand can offer, we set out next to scale Fox Glacier, one of the two mammoth glaciers nestled in the Southern Alps range.

Hikers have a few options when it comes to exploring these ice mounds. Tour operators offer guided half-day or full-day hikes, as well as the more ambitious "heli-hikes," in which visitors are flown via chopper to dig their heels into the glacier's snowy upper plateau.

We chose a full-day hike, at a cost of NZ$79 (US$53) each. The day began by suiting up, which meant trading our hiking shoes for thick-soled leather boots, wool socks and a sturdy yellow rain jacket of the kind your mom likely made you wear to elementary school on a rainy day.

Our walk started with a steep ascent through the rainforest that flanked the ice, but rather than curse another climb, we accepted it, knowing we'd soon get a look at a rare natural phenomenon.

But our first glimpse of the ice was disappointing. Like many who've seen glaciers only on nature documentaries, we anticipated stepping up to a block of glistening bluish ice.

Instead, chunks of black gravel and fallen rock from the adjacent mountains littered sections of the glacier, making large areas of it look as gritty as three-day-old snow in Manhattan.

We began hiking on the ice—after we'd strapped crampons to our boots—and immediately felt dwarfed by its massive span. The glacier was much more than an ice block, it was a landscape with jagged peaks and smooth valleys formed by water we heard rushing as far as 328 feet beneath us.

We trekked on the glacier for several hours, navigating its slippery terrain on a path of steps carved ahead of us by guides who chipped at the surface with ice axes.

It was slow going, but the pace suited us fine. There was time to explore ice caves and peer into crevasses. It didn't take long to find those brilliant patches of blue ice, which were even more mysterious up close. As I ran my gloved hand over a cave wall, I thought there was no end to this island's natural wonders.

Later that evening over pints of New Zealand's Speight's lager, my husband and I reflected on the places we'd been and agreed that their beauty was matched only by the adventure of getting to them. ◆

IF YOU GO

Get up-to-date information about accommodations, transportation and outdoor activities, including skiing and golfing, at New Zealand's official tourism site (www.newzealand.com/travel).

Both Qantas Airlines and Air New Zealand (in conjunction with United) offer flights from New York, stopping in Los Angeles. For flight information, visit the United Airlines Web site at www.united.com or Qantas Airlines at www.qantasusa.com.

Brittany Schaeffer

DAILY NEWS Sunday, October 3, 2004
DAILY NEWS Sunday, October 3, 2004

Mystery surrounds monster gecko find

from The Dominion (Wellington) NZ
Sept. 1984.

MR BAUER . . . detective work

IN A PUZZLING but exciting discovery, a new species of apparently extinct giant gecko lizard from New Zealand has been found in a small museum in Marseilles.

The 60-centimetre-long specimen is the largest gecko in the world.

The single stuffed specimen is believed to have been taken from New Zealand in the early 19th century — possibly by the French explorer d'Urville.

The discovery of the gecko and its tracing to New Zealand is the result of a piece of international detective work by Aaron Bauer from the Museum of Vertebrate Zoology at the University of California, Berkeley.

By LINDSAY CLARK
Science Reporter

Mr Bauer, a doctoral student in herpetology — the study of reptiles and amphibians — revealed his discovery to The Dominion yesterday.

His astonishing find has yet to be published in scientific journals.

He said though the animal was believed to have been extinct since the middle of last century, it was still possible the gecko was alive in areas of rugged native forest in the North Island.

"I would not be overly surprised if it were found alive," he said in Wellington yesterday. Two new species of small New Zealand gecko have been described since 1981 — including the gaily-patterned harlequin gecko from Stewart Island which features on a stamp series.

The story of the uncovering of the mystery gecko began in the late 1970s when the curator of the Institute of Natural History Museum in Marseilles where the lizard is housed contacted the British Museum about it.

The curator was unwilling to let the specimen out of the museum.

Dr Anthony Russell, then a student in London, learned of the animal's existence, wrote to Marseilles in 1979 and obtained x-rays of it. Dr Russell, who is working with Mr Bauer on the project, showed him the x-rays in 1983.

Mr Bauer decided to try to identify the specimen in the course of a world trip that included Europe, New Caledonia and New Zealand.

Mr Bauer found that the specimen had been stuffed, rather than preserved with alcohol — a more orthodox method. But stuffing proved an advantage in that the colour of the skin, though faded, still showed whereas alcohol preservative made reptile skins grey over time.

The animal was a yellowish-brown colour with two dull brick red stripes running from behind the head to the base of the tail.

It is about the same size as New Zealand's "living fossil" — the tuatara.

Mr Bauer took photographs and recorded all the facts he

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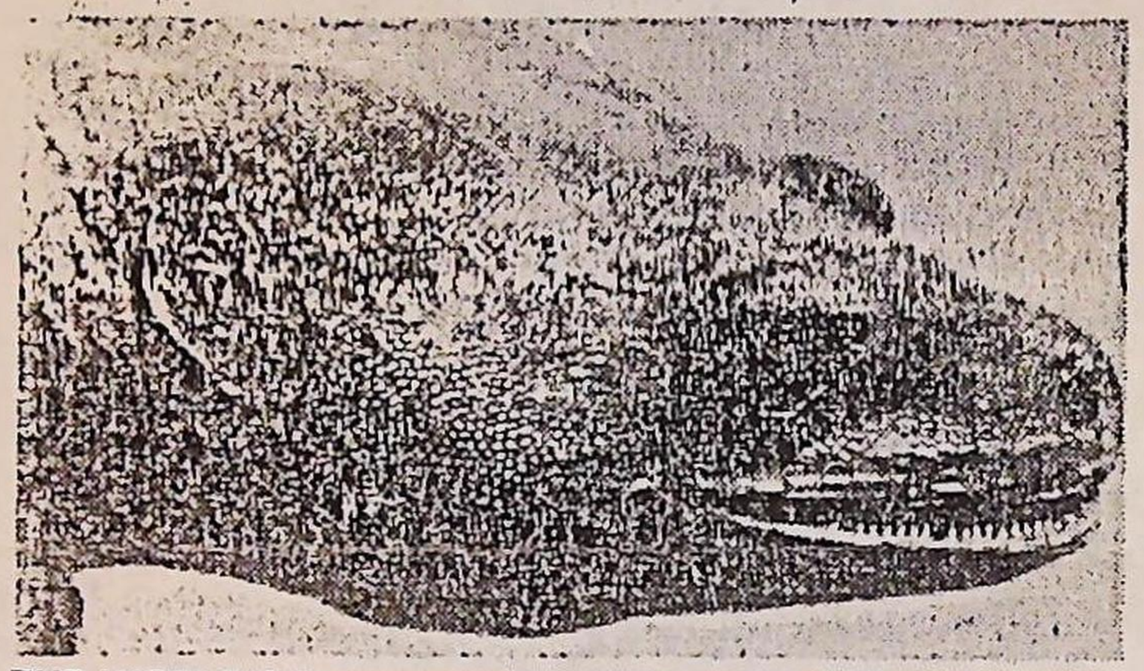

THE WORLD'S largest gecko which may still live in North Island forests.

Mystery giant gecko

☐ FROM P1

could about the incomplete specimen.

He said it was obvious to him that it was from a genus of geckos found only in the southwest Pacific.

At first he though it must be from New Caledonia where the largest living gecko is found.

Because New Caledonia was a French colony, it seemed logical that a French colonist or collector must have brought the unnamed lizard to the out-of-the-way museum which is scarcely known outside of France.

But after mulling things over, Mr Bauer decided the key characteristics of the animal more closely resembled the New Zealand brown geckos. The specimen had less webbing between the toes than the New Caledonian geckos and more pronounced claws.

This inital conclusion was confirmed by some fascinating reports of Maori legends about a large lizard and sightings by early European settlers.

Elsdon Best, Wellington-born writer on Maori traditions and the first ethnologist at the Dominion Museum, wrote of the role of the lizard in Maori folklore and carvings early this century.

In a book on Maori forest lore in the Ureweras, Best mentioned a lizard two feet in length with a granular appearance — typical of geckos.

Mr Bauer said these early reports normally could not be taken too seriously as scientific evidence. But with the anatomical evidence pointing to the animal being a member of the New Zealand brown geckos, the anecdotal reports accurately supported this view.

He and Dr Russel have therefore decided to place the mystery lizard in the same genus as the New Zealand geckos.

The two scientists do not want the name they have chosen for the lizard published in this report as that would technically constitute a species description. This would make their zoological classification in the scientific paper being published irrelevant.

Mr Bauer said he was hopeful further evidence would come to light both from the French and New Zealand angles.

He thought it quite possible that d'Urville may have collected the gecko in New Zealand in his first voyage to this country in 1827-28. It is known that collections from his ship, the Astrolabe, were unloaded in Marseilles.

He is hopeful the gecko will not prove extinct like the moa, but be rediscovered like the takahe. Because geckos are nocturnal, it is possible they could have survived unseen in dense forest.

He thinks Northland and the central North Island are the most likely areas where the lizards could still exist. He is interested in any information about large lizards that anyone could provide.

His best hope for absolute proof the gecko lived in New Zealand may lie in museums around New Zealand. Old bones thought to be from tuataras may prove, on more detailed examination, to be from the giant gecko.